



Molex Power Interconnect Solutions

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**Molex Global Product
Manager**

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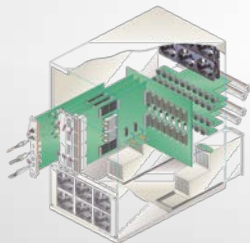
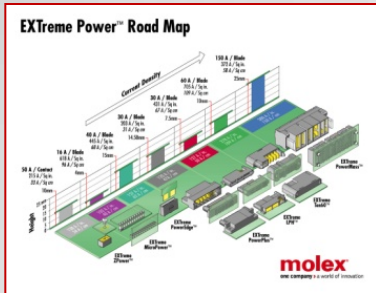
Power Product Applications

Markets/Applications

- › White Goods (Residential or Commercial Appliances)
- › HVAC
- › Lighting
- › Consumer Electronics
- › Computer Servers
- › Networking Equipment
- › Telecommunications Equipment
- › Marine
- › Commercial Vehicles
- › Gaming
- › Automotive

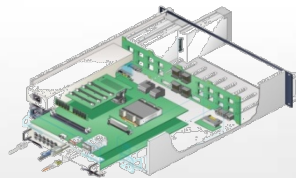
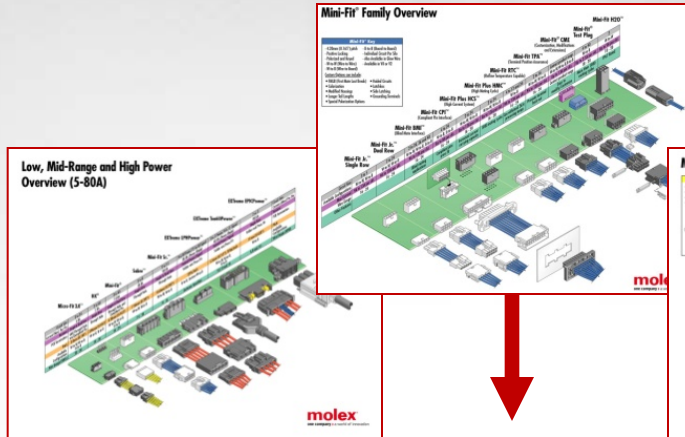
Molex Power Interconnect Solutions

>20A per contact

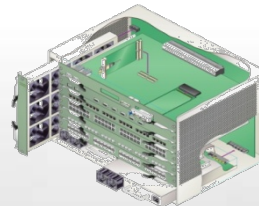


Data Networking

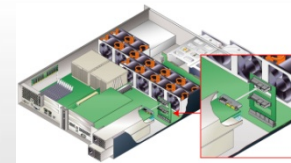
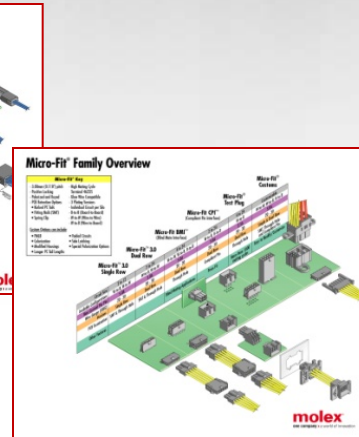
5 – 20A per contact



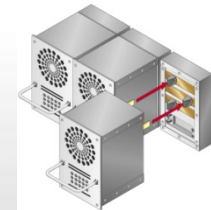
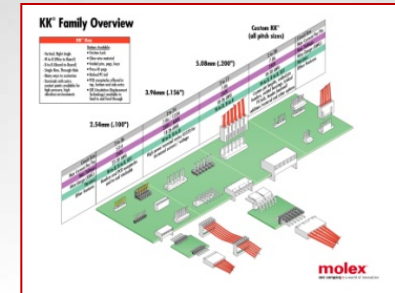
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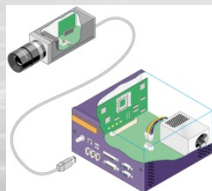
Telecom



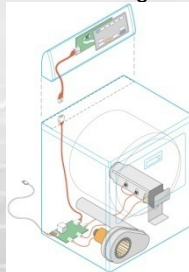
Server



Power Supplies



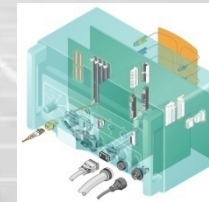
Industrial



Appliance



Medical



Military



Automotive

Different Types of Power Interconnects

› Power Delivery

- Gets power to the system

› Power Distribution

- Takes the delivered power and gets it to different subsystems

› Central theme in electronics

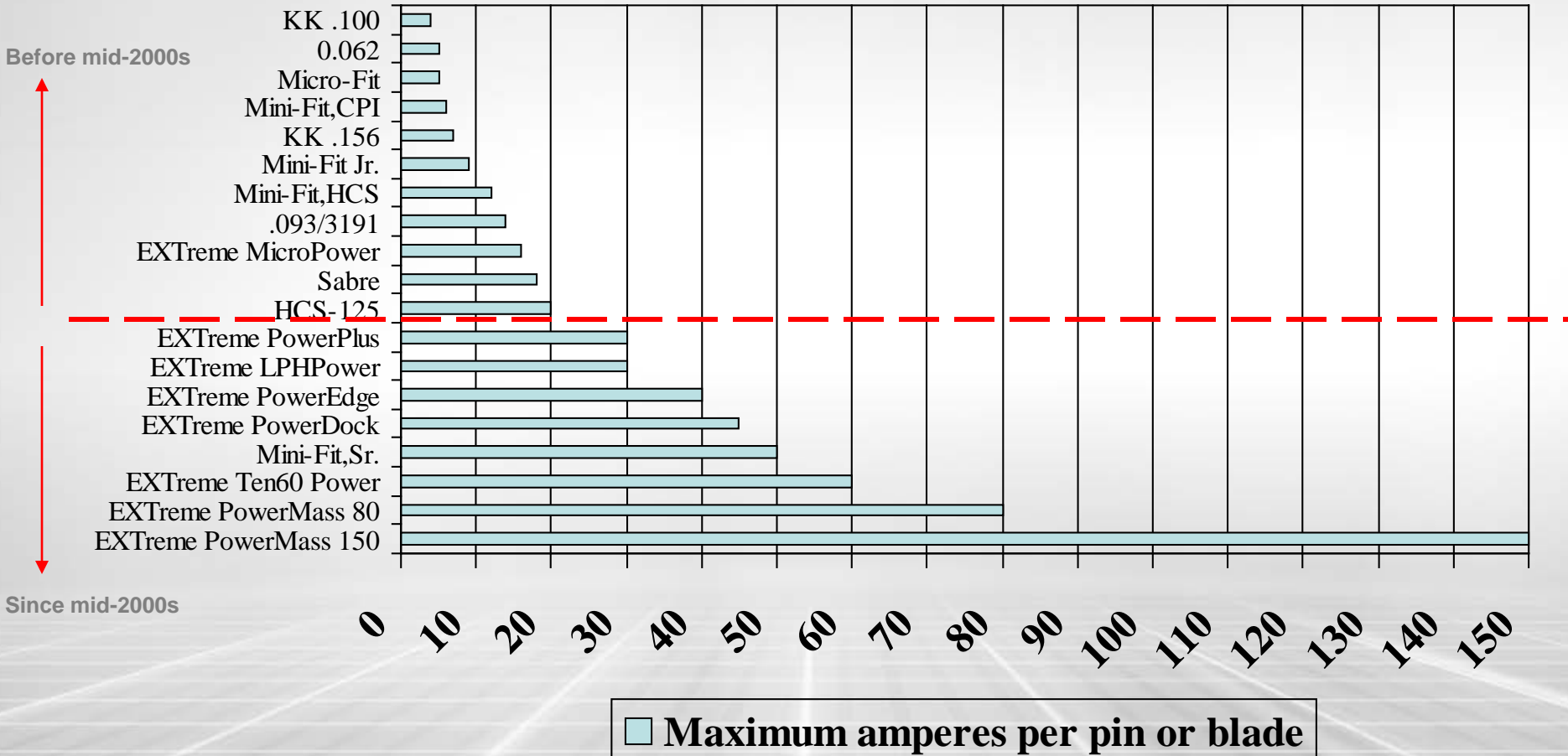
› Examples

- Everyday => Cellphone
- Exotic => High End Mainframe Server

› Logical to ask customers about one when brought in for the other

Molex Power Market Coverage

Molex Power offering before and after EXTreme Power™





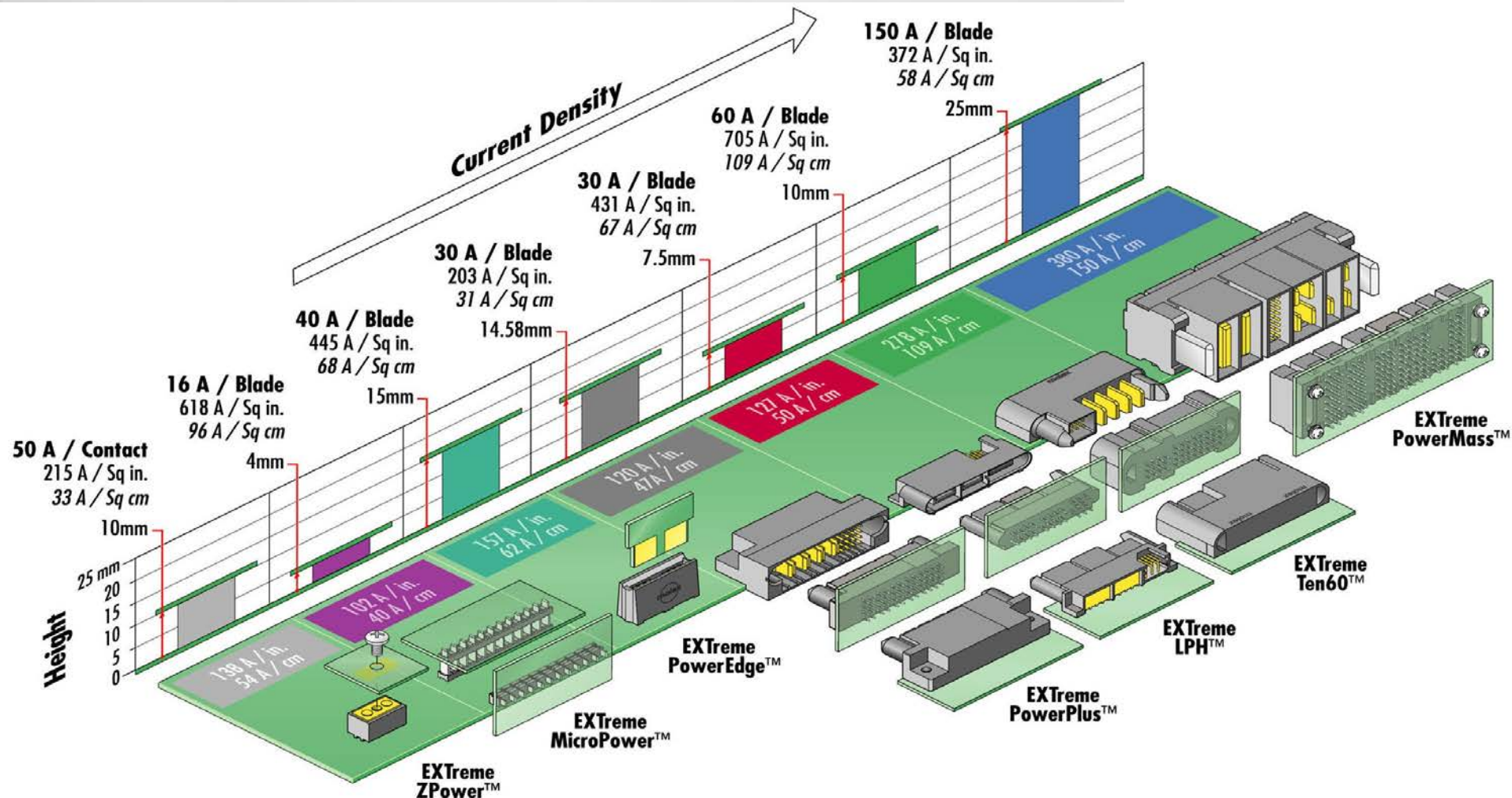
Power Delivery Interconnects

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Key Features and Needs in Power Delivery Connectors

- › Greater than 20A per contact current rating
- › Mostly board-to-board
- › Power contacts are blades instead of pins
 - More surface area for heat dissipation
 - More robust
- › Reduced size
 - Low Profile
 - Shorter board edge length
- › Greater Current Carrying Capacity per Blade
- › Hybrid Design Combining Power & Signal Interfaces
- › Flexible Design Options
 - Coplanar, R/A, Mezzanine
 - Board-Board, Wire-Board
 - AC & DC Power Capability

What Does Molex High Current Power Look Like?



Power and Signal Hybrid

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EXTreme Power Edge™

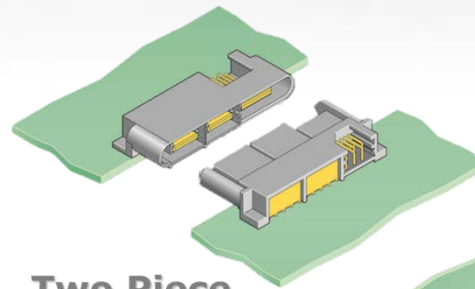


Mixed power/signal
assembly stacked with a
signal assembly

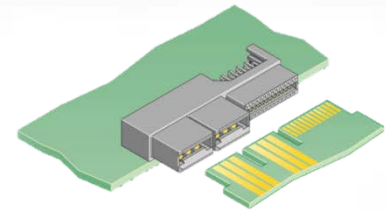
- › Isolated contacts on opposite side of connector assembly
- › Matches individual traces on each side of a double sided card edge
 - Allows for 2 power circuits per segment at 40A per contact
 - Allows for 8 total signal circuits per segment
 - 2 to 6 segments available
- › Power Edge™ connectors can be end-to-end stacked to mate with PCB edge cards or bus bar lengths up to 8" (203.2mm)
- › Pressfit tails

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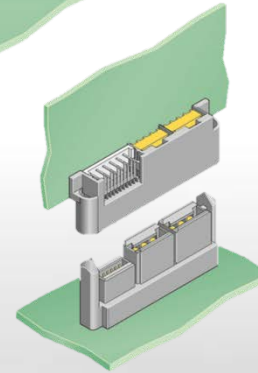
EXTreme LPH-Power™ (Low Profile Hybrid)



**Two Piece
Coplanar**

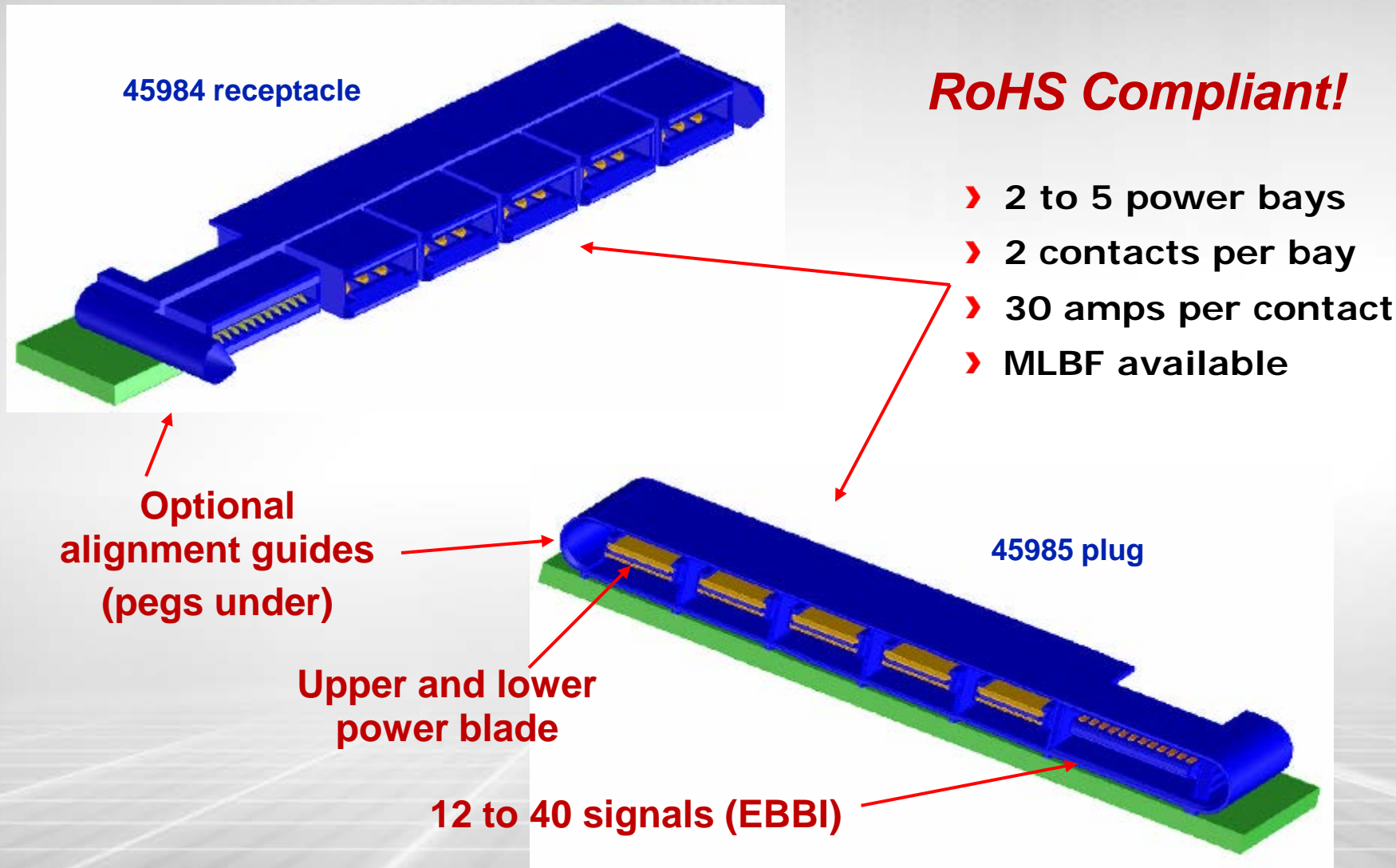


**One Piece
Card Edge**



Vertical - R/A

LPH™ Product Detail



LPH™ Product Features

› 7.5mm height

- Improves system airflow

› Excellent current density

- Up to 120 amps per inch

› Hybrid design

- Mixed Power & Signal

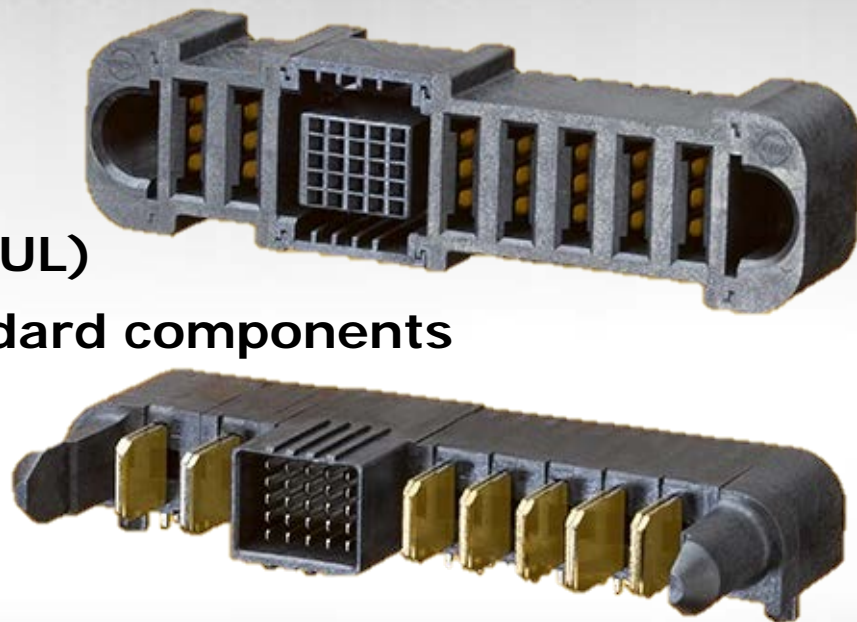
› Flexible configuration

- 4 to 10 power blades R/A plug & receptacle
- 4 to 14 power blades vertical receptacle
- 12 to 40 signals (4 circuit increments)

› Two Piece or Card Edge mating options

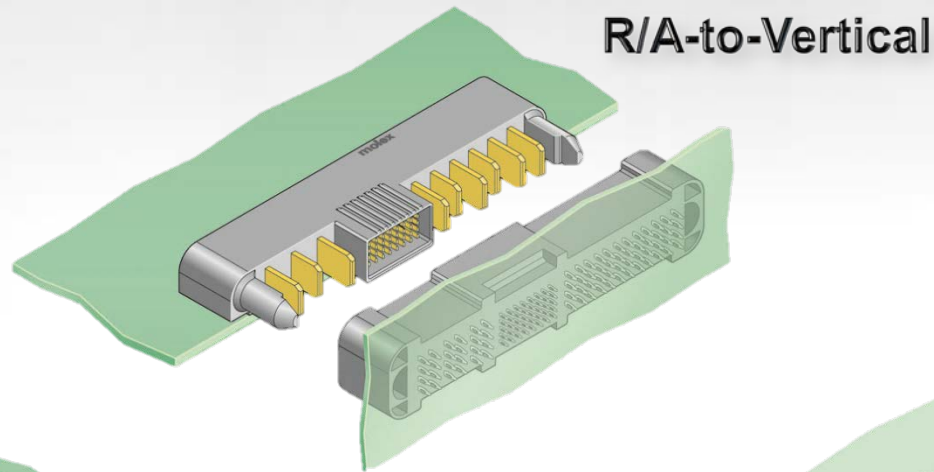
EXTreme Ten60Power™ Overview

- › **10mm height**
 - Minimizes airflow interruption
- › **60 amp per blade at 30° C T-rise (UL)**
- › **Custom assemblies based on standard components**
 - No tooling charges
- › **Pressfit or soldertail**
- › **5.5mm (DC) or 7.5mm (AC) pitch**
- › **Up to 600 Volts**
- › **Integrated signal modules**
 - 5-row (HDS) 2mm X 1.65mm
 - 3-row (legacy) 2.5mm X 2.5mm
- › **Integrated guides for blind mating**

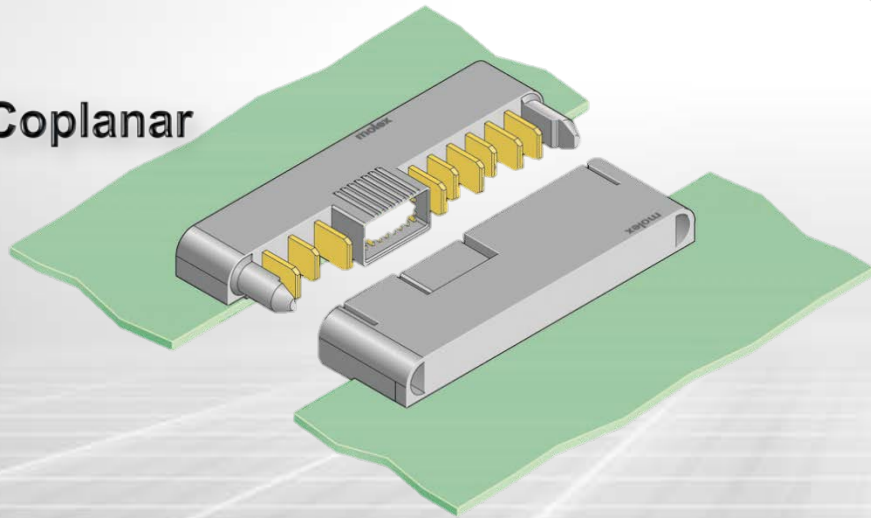


Product Family Overview

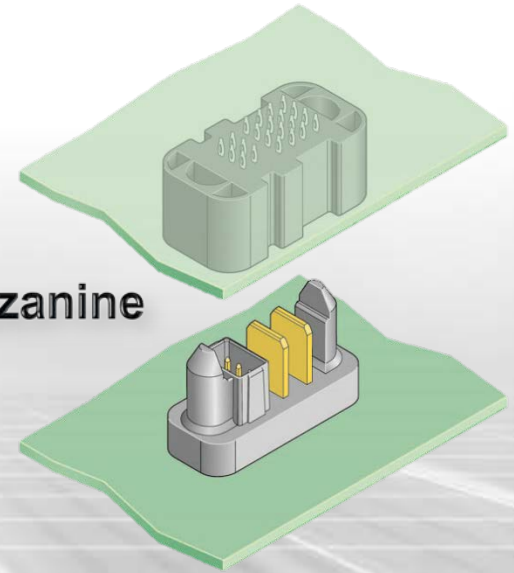
Board-to-board
(BTB) power
delivery



Coplanar



Mezzanine



EXTreme Power-Mass™

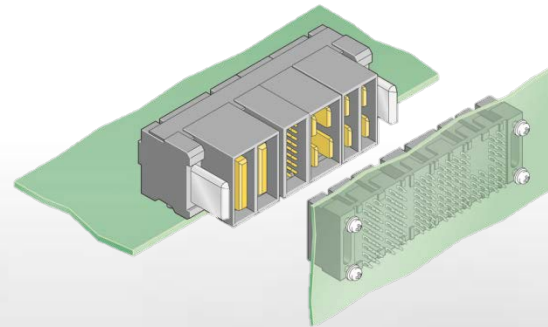
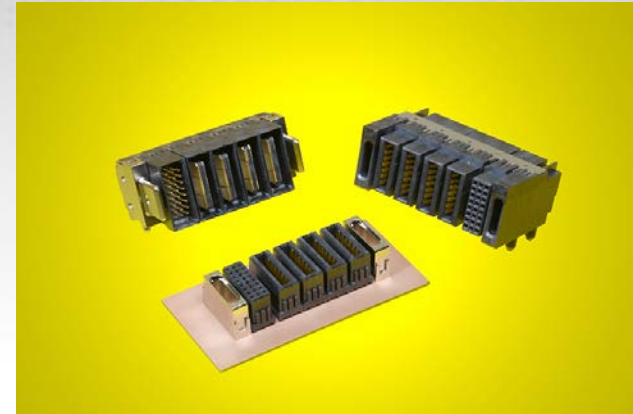
› Highest Current Density BTB available!

- 350 amps per inch
- Low IR^2 losses

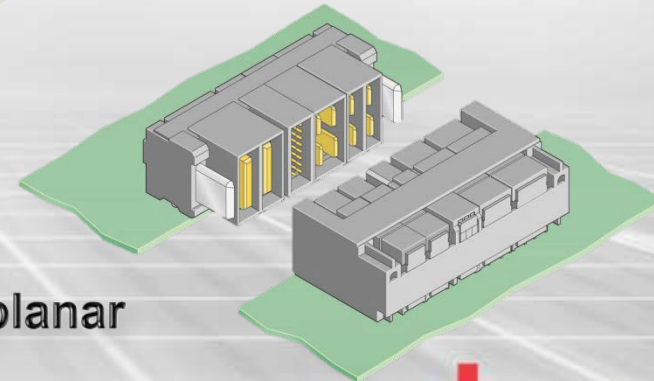
› Maximum Design Flexibility

- Modular design
 - 150 amp
 - 80/40 amp
 - MultiPath
 - 8-64 Signals
 - Guides

› Available in pressfit and soldertail in all orientations



R/A-to-Vertical

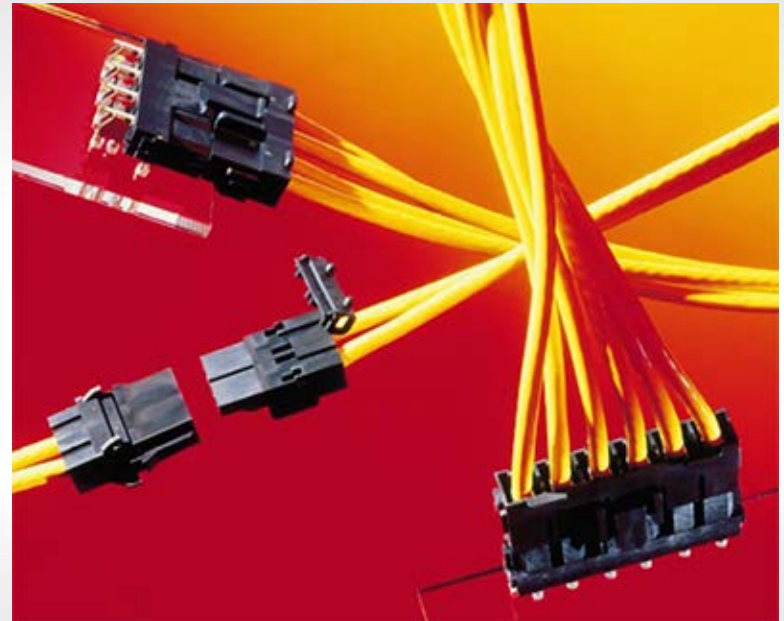


Coplanar

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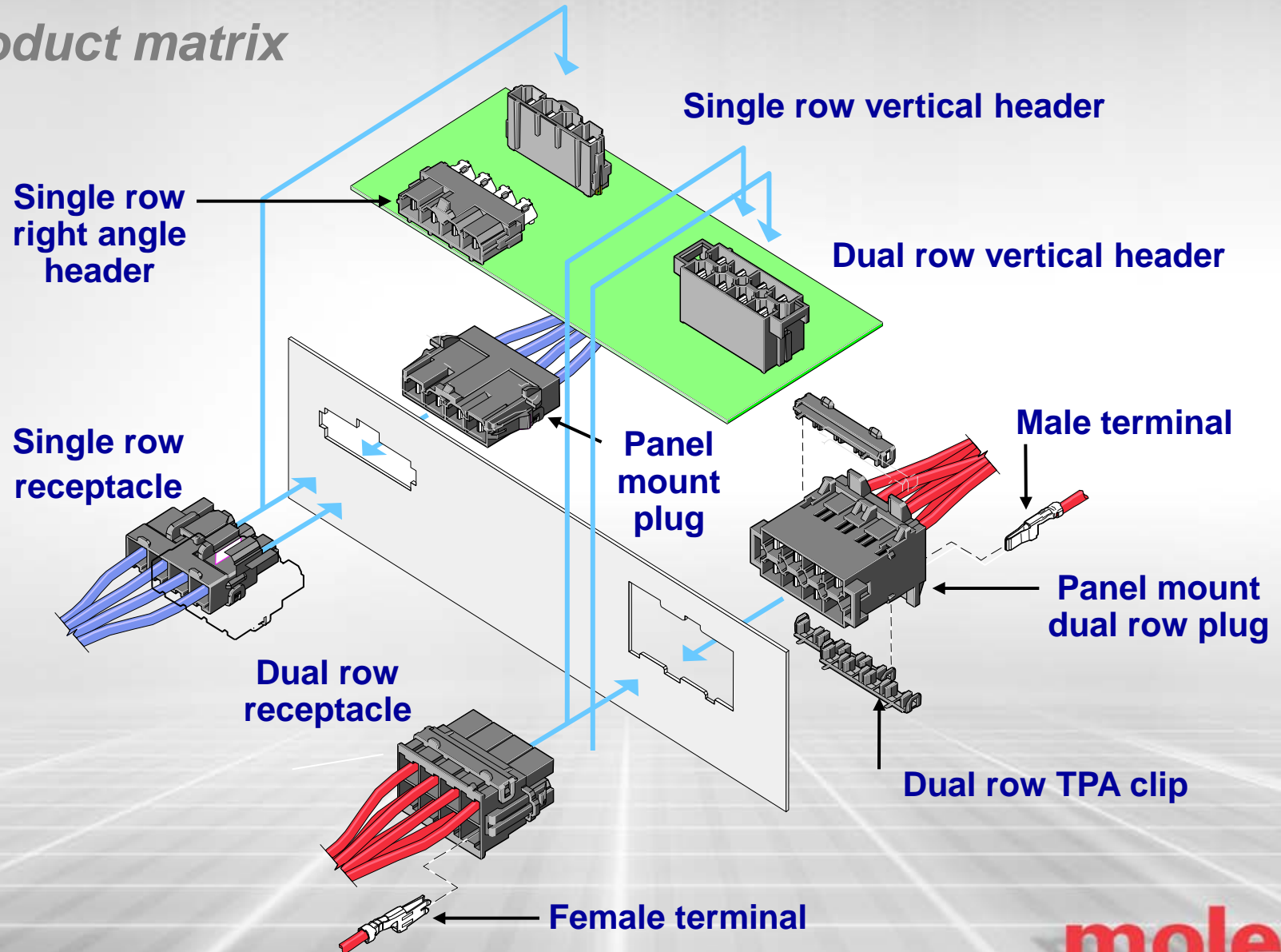
Mini-Fit Sr.

- › **High power extension of Molex's Mini-Fit line**
 - Can be used for power delivery
- › **10.0mm (.394") pitch**
- › **50.0A per circuit maximum**
 - On a 2-circuit wire-to-wire system with 8 AWG wire
- › **Voltage rating – 600V AC (RMS) / DC**
- › **Wire-to-wire, wire-to-board**



Mini-Fit Sr. Product Overview

Product matrix





Power Distribution Interconnects

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Key Features and Needs in Power Distribution Connectors

- Less than 20A current rating per contact
- Available in wire-to-wire, wire-to-board or board-to-board configurations up to 40 circuits in a single connector system
- Multiple design elements in connector system to match a greater variety of customer application requirements
- Customization potential
- Molex product families are on the Design Registration Program

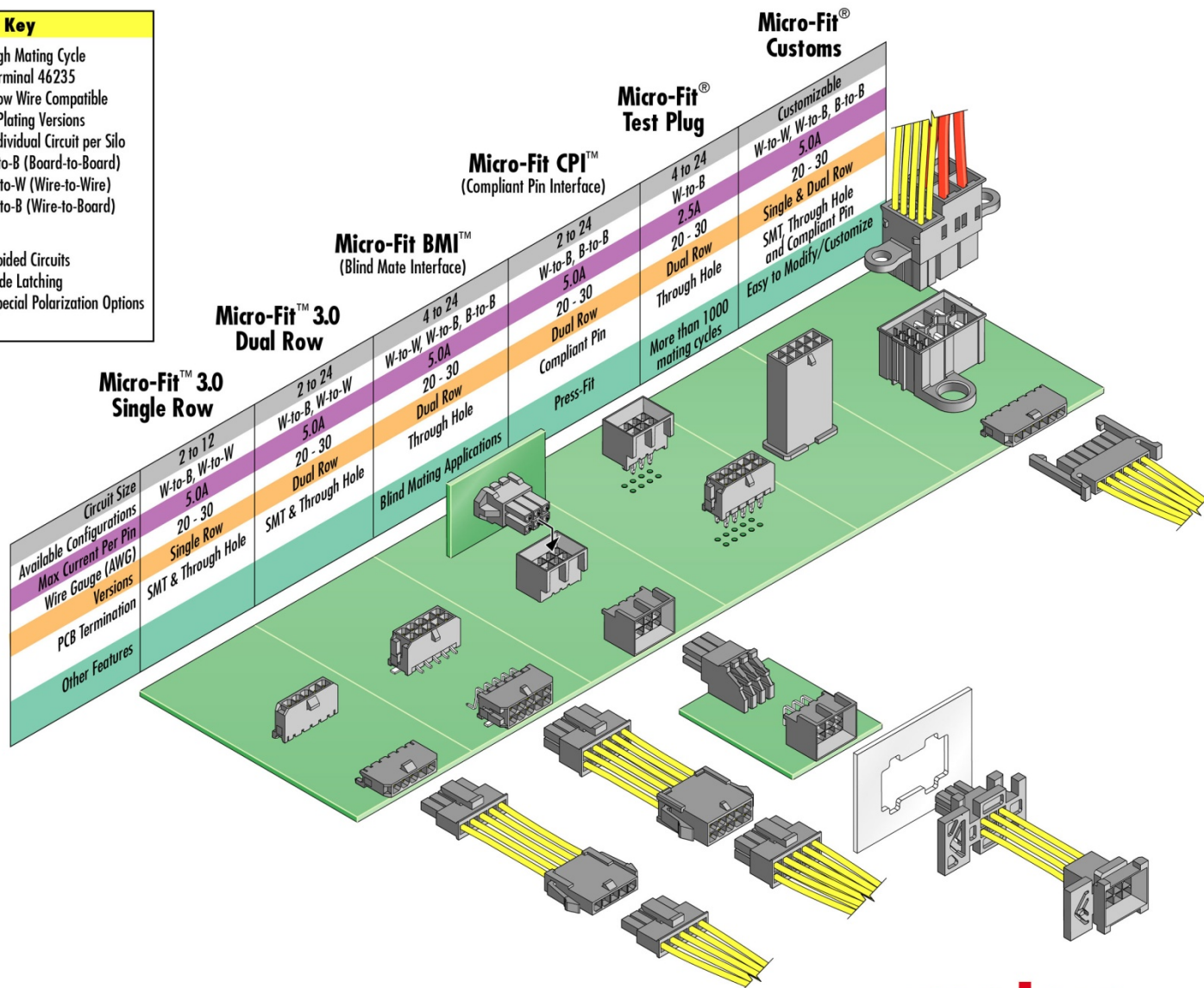
Micro-Fit® Family Overview

Micro-Fit® Key

- 3.00mm (0.118") pitch
- Positive Locking
- Polarized and Keyed
- PCB Retention Options
 - Kinked PC Tails
 - Fitting Nails (SMT)
 - Spring Clip
- High Mating Cycle Terminal 46235
- Glow Wire Compatible
- 3 Plating Versions
- Individual Circuit per Silo
- B-to-B (Board-to-Board)
- W-to-W (Wire-to-Wire)
- W-to-B (Wire-to-Board)

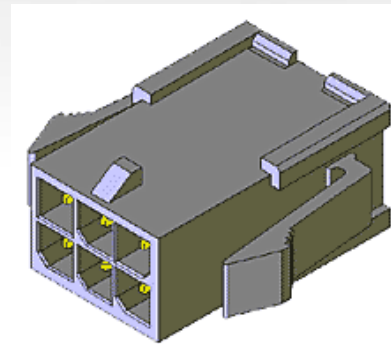
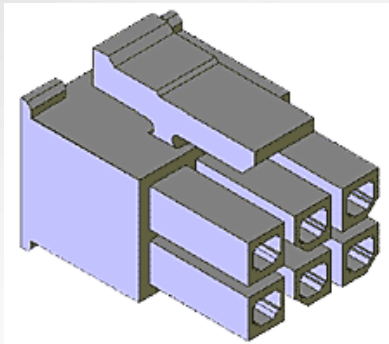
Custom Options can include:

- FMLB
- Colorization
- Modified Housings
- Longer PC Tail Lengths
- Voided Circuits
- Side Latching
- Special Polarization Options



Micro-Fit® 3.0

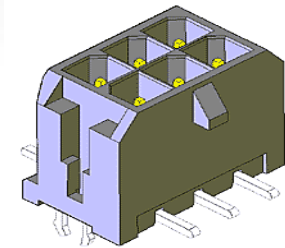
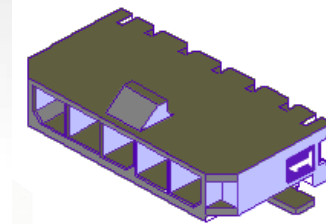
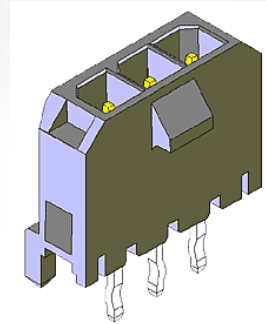
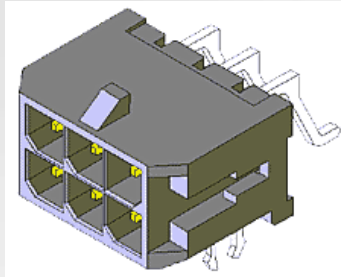
Plugs and Receptacles



- › Fully polarized housing → Prevents accidental mismatings
- › Fully isolated terminals → Electrical and mechanical protection
- › Positive latching → Prevents accidental disconnects
- › Integral pull tabs → Keep from pulling wires
- › Optional panel mount ears → Lock in panel of application
- › 94V-0 polyester → For optimum flammability rating

Micro-Fit® 3.0

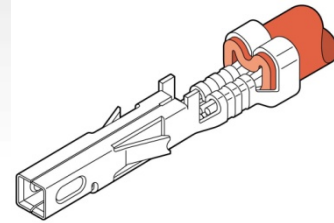
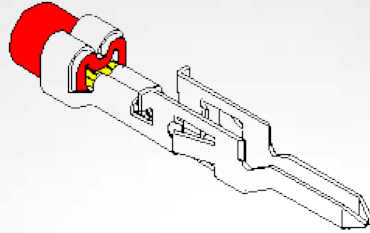
Header Features



- › SMT and SMC Versions (LCP material)
 - › Fully polarized housing
 - › Molded peg, clip, or solder tab
 - › Fully isolated terminals
 - › T&R packaging on SMT version
 - › Coplanarity on SMT tails
- ➔ Able to withstand high-temp processes
 - ➔ Prevents accidental mismating
 - ➔ Additional retention to PCB
 - ➔ Electrical and mechanical protection
 - ➔ Automated placement
 - ➔ Less thickness of processing solder paste

Micro-Fit® 3.0

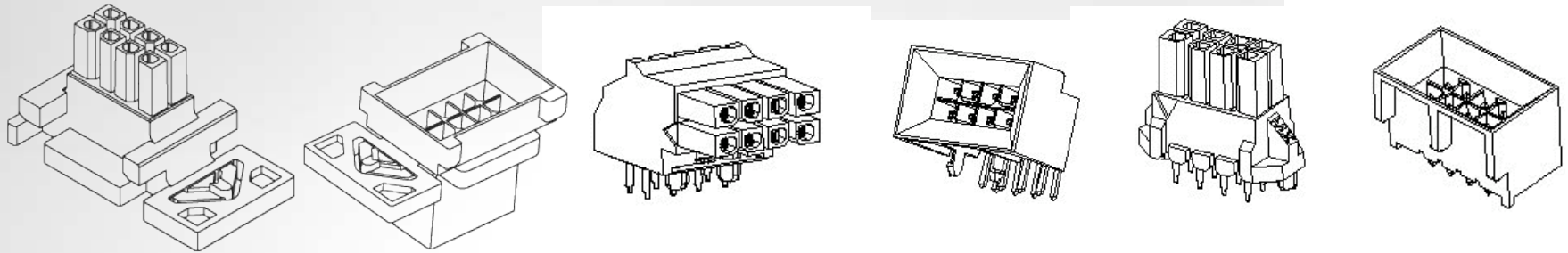
Crimp Terminal Features



- › Same design as Mini-Fit®, Jr.
- › Four points of contact
- › Anti-overstress locking tangs
- › Terminal-to-housing orientation
- › Phosphor bronze base material
- › 20-24 AWG and 26-30 AWG
- › Plating options
- Field proven over many years
- Redundant contact style
- Prevents terminal pullout
- Prevents insertion to wrong housing
- Good strength and conductivity
- Variety of options
- Versatile – signal and power

Micro-Fit® 3.0 BMI

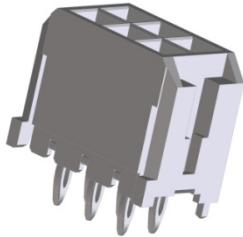
Housing & Header Features



- › High temp glass-filled nylon
- › Panel mount option
- › Floating panel mount receptacle
- › Headers available in vertical and right angle versions
- ➔ Surface mount capability
- ➔ Easy insert and removal for panel applications
- ➔ Allows movement .050" in any direction for increased blind mating ability
- ➔ Allows for parallel, perpendicular, and coplanar board to board applications

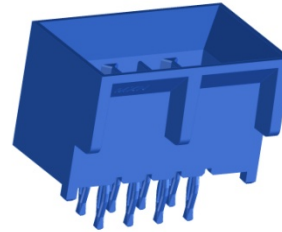
Micro-Fit® 3.0 CPI

Header Features



Standard CPI
Vertical Header

- › Compliant pin interface
- › Eye of the needle



BMI CPI
Vertical Header

- ➔ Allow for solder-less processing
- ➔ For use on thicker PCBs
- ➔ Reliable press fit solution

Micro-Fit RMF™

(Reduced Mating Force Terminal)

- › **Designed for reduced mating force**
 - Improved version of proven original Micro-Fit terminal
 - Reduces mating forces by 50% over standard design
- › **Rated for 40 mating cycles without lubrication, 250 mating cycles with lubrication**
- › **No new crimp tooling is required**
- › **Same crimp ranges as standard terminal**
 - 22-24 and 26-30AWG
- › **Available in 15 and 30 µin Au plating,**
- › **Current rating is same current as standard terminal**

NEW Twin Cantilever Design



Existing Box Design



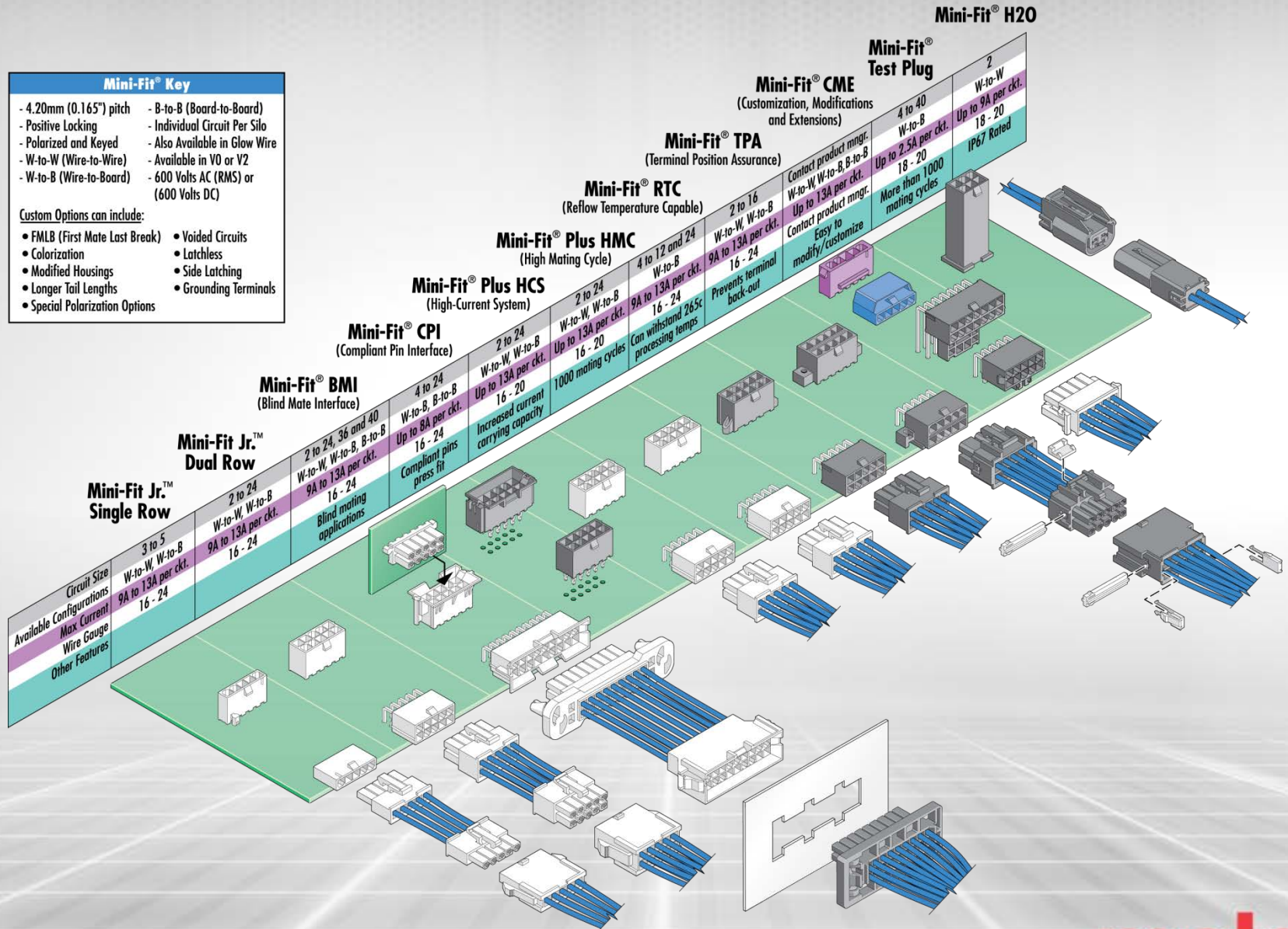
43030 - Box Design

Mini-Fit Family Overview

Mini-Fit® Key	
- 4.20mm (0.165") pitch	- B-to-B (Board-to-Board)
- Positive Locking	- Individual Circuit Per Silo
- Polarized and Keyed	- Also Available in Glow Wire
- W-to-W (Wire-to-Wire)	- Available in V0 or V2
- W-to-B (Wire-to-Board)	- 600 Volts AC (RMS) or (600 Volts DC)

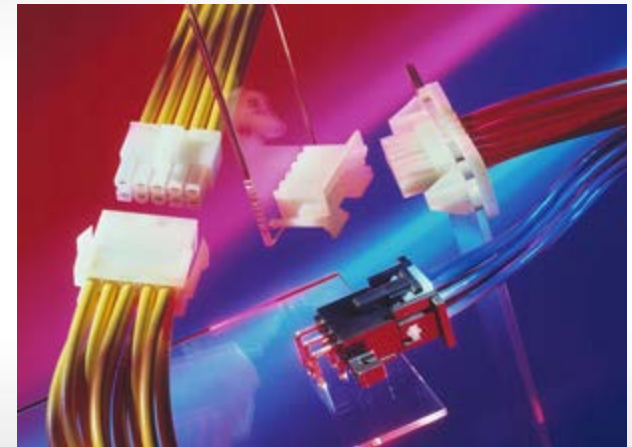
Custom Options can include:

- FMLB (First Mate Last Break)
- Colorization
- Modified Housings
- Longer Tail Lengths
- Special Polarization Options
- Voids Circuits
- Latchless
- Side Latching
- Grounding Terminals



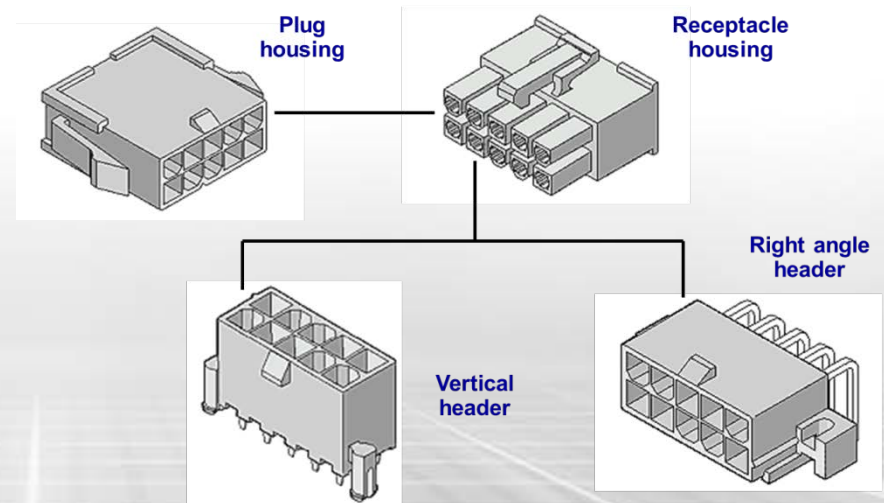
Mini-Fit® Family

- › **Most prolific mid-range power product family in the market today**
 - Widest selection and configurations of products
- › **FY 2012 sales**
 - 300 billion terminals
 - 45 different part number
 - 1Billion housing
 - 3000 part numbers
- › **Over 4000 active part numbers**
- › **Used across almost every industry and within most customers around the world**
 - Widely available through distribution
 - Tooling readily available at CM's and Harness houses
- › **Global manufacturing footprint**
 - US, Mexico, China, India, Japan



Mini-Fit Jr.®

- › **High density power connectors**
 - 4.2mm pitch
- › **Electrical performance**
 - 9A - standard terminal
 - 13A - Plus HCS terminal
 - 600V
 - 10m ohm contact resistance
- › **-40c to +105c operating temperature**
- › **Mechanical features**
 - Positive locking
 - 16-28 AWG terminals
 - Polarized
 - Isolated terminals
- › **Configurations**
 - Wire to Wire
 - Wire to Board
 - Board to Board
- › **2-24 circuit standard – availability to support higher circuits**



Mini-Fit Jr. Materials

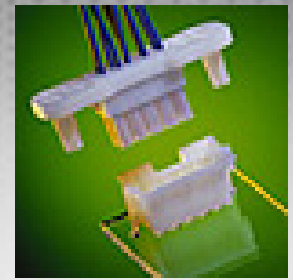
› Housings

- Traditional Nylon or LCP resins
- White or black color options
- 94V0 or 94V2 flammability ratings
- Glow wire compliant
- Halogen free
- Reflow solder compatible 265° C

› Terminals

- Tin and Gold
- Phos-Bronze and Brass base metal alloy

Mini-Fit® BMI (Blind Mating Interface)



Blind Mating Interface

- › Wire to Wire, Wire to Board, Board to Board
- › Capable of up to 13A (using Plus HCS) per circuit
- › Circuit sizes ranging from 4-24; 36 and 40 ckts
- › Vertical (through hole and press fit) and Right Angle (through hole) Headers
- › Dual-row and space-saving single row configurations
- › Ideal for Blind Mating, hard to reach, hard to see areas of application
- › Self-aligning float feature allows for misalignment up to 0.100" in any direction
- › Panel mount receptacles; Spiral or Slide-and-Lock
- › Configurations
 - Panel-to-panel
 - Panel-to-board
 - Board-to-board
- › Intermateable with Mini-Fit Jr.

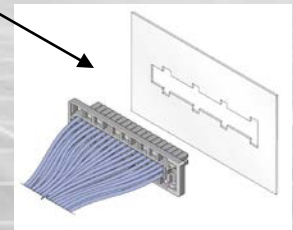


Spiral receptacle

Mating capture funnel



Slide-and-Lock receptacle

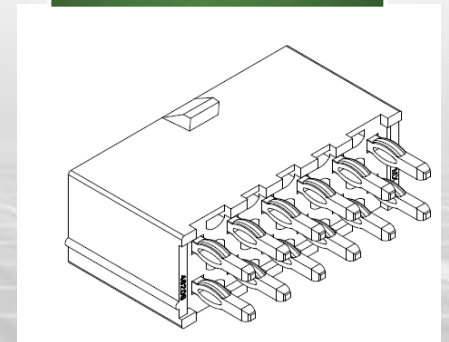


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Mini-Fit CPI™

Compliant Pin Interface (press fit header)

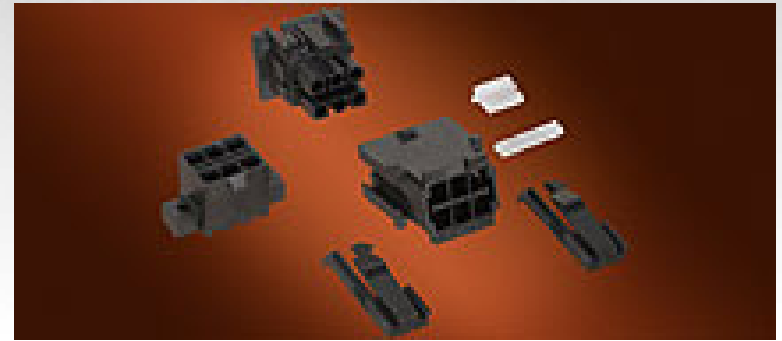
- › Available in blind mate or standard headers
- › Wire-to-Board, Board-to-Board
- › Vertical, dual row headers
- › Capable of up to 9A per circuit
- › Circuit sizes 4-24
- › 16 to 24 AWG
- › .042" square contact (solid phosphor bronze)
- › Eliminates soldering and lowers applied costs associated with
 - Expensive lead-free solders
 - Pre- and post-solder cleaning
 - Rework due to faulty solder joints
 - Potential damage to PCB



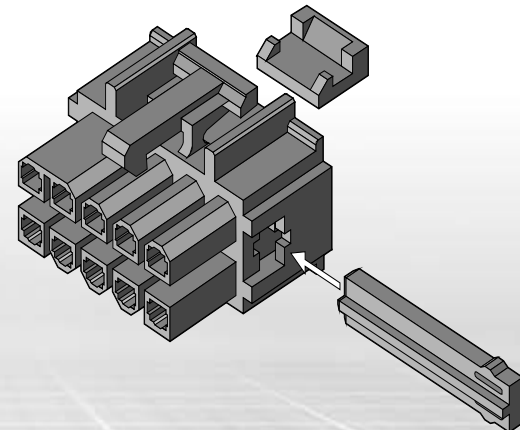
Mini-Fit® TPA

Terminal Position Assurance

- › Designed for mating security
- › TPA will fully seat only if all terminals are fully seated
- › For applications with high vibration or safety concerns
- › CPA – Connector Position Assurance (Optional)
 - Assures housing cannot be disengaged
- › Not intermateable with other Mini-Fit families
- › Can use any Mini Fit terminal, including HCS, Plus and Plus HCS
- › Contrasting color keys
- › Available in Wire to Wire or Wire to Board
- › Optional Plug Panel Mounting Ears



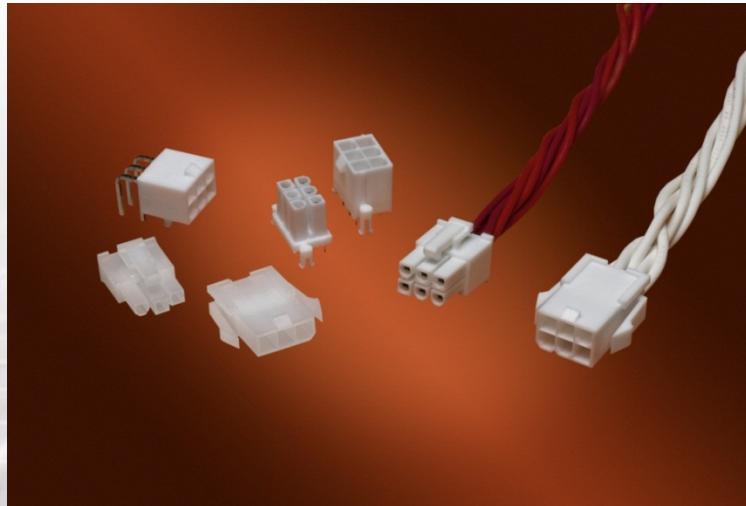
CPA key prevents housings from disengaging



TPA key prevents terminal backout

Mini-Fit High Current Power Options

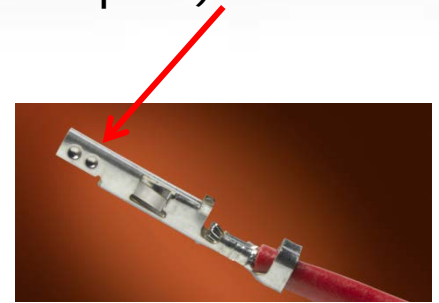
- Mini-Fit Jr. – 9Amps
- Mini-Fit HCS (High Current System) – 11Amps
- Mini-Fit Plus HCS – 13Amps
- Mini-Fit Plus HMC (High Mating Cycles – 13Amps / 1500 cycles



Crimped Contacts

› Female crimp contact

- Its all about the base metal – for amperage ratings
 - Also the 2 elongated points of contact (vs. 2 dimples)
- Mini-Fit HCS (11A)
 - Uses a high current base alloy
- Mini-Fit Plus HCS (13A)
 - Uses an ultra-high current base alloy



› Male crimp contacts for each system

- Uses the same alloy to allow for matched amperage rating

› Both male and female contacts fit into standard Mini-Fit plug and receptacle housings

The Tricky Part - Headers

› If the header uses solid pins

- They can handle 13Amps
- Example – almost all RA Mini-Fit Jr. headers

› If the header uses stamped & formed pins

- They require a special high current base alloy
 - Just like the crimped terminals (also stamped and formed)
- There are separate series for HCS and Plus HCS

› General rule of thumb

- Right angle headers - can support 13Amps as is
- Vertical headers - need new part numbers to support 13Amps

› There are always exceptions

- Amperage ratings are listed on the web
- Do not mate tin and gold

Mini-Fit Plus HMC

- **The Plus HMC is 13Amps – 1500 mating cycles**
 - Same rules apply as the Plus HCS – Amp ratings
- **It is virtually the same female contact as Plus HCS**
 - Except the interface has been specially modified to allow for high mating cycles
- **The female contact holds the secret sauce**
 - It is only available with gold plating
 - It mates up to any gold Mini-Fit male terminal
 - WTW and WTB
 - Obviously the mating part will determine the amperage
- **Fits into any standard Mini-Fit receptacle**

Transition Plan

› Replace Mini-Fit Jr. or Tyco Val-U-Lok with high current Mini-Fit

- Allows customer more power in same housing
- Reduces heat in customers application

› Focus on the Plus HCS and Plus HMC

- All HCS (11A) parts are now A7
- Will continue to support – focus on 13A systems

› The footprint and the housings are the same

- For Mini-Fit Jr. & the high current Mini-Fit systems

› Don't be scared

- All terminals are interchangeable & can mate to other Mini-Fit families
 - They will be rated at the lowest amperage of the system components

Mini-Fit® Family

Competition – Mini-Fit® Jr.

› TYCO Val-U-Lok

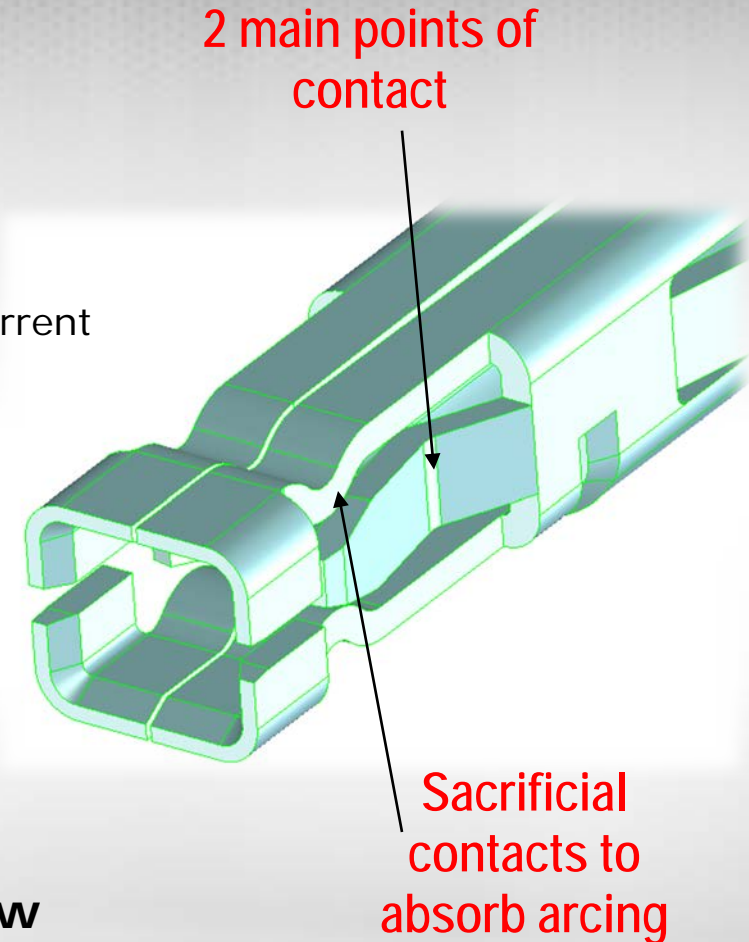
- Wire-to-wire, wire-to-board
- Mini-Fit® Jr. family
- No BMI, Plus HCS, Plus HMC, RTC
- UL approval invalid when mating with Molex connectors

› Cvilux

- Largest Asian Competition for Mini-Fit® Jr.
 - Located in Taiwan
 - Low cost
 - Inferior in Quality
- Wire-to-wire, wire-to-board
- Mini-Fit® Jr. family
- No BMI, Plus HCS, Plus HMC, RTC

Mega-Fit®

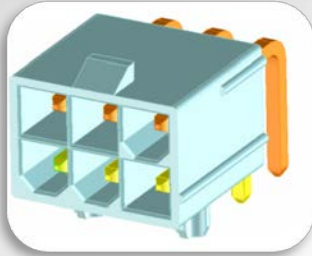
- › Similar housing design as Mini-Fit®
- › Amperage ratings up to 20A per ckt
- › Box style contact system
 - › 6 points of contact, 4 sacrificial for accidental current interruption
- › 5.70mm pitch
 - › Mini-Fit® 4.20mm pitch
 - › Micro-Fit® 3.00mm pitch for
- › Launching with Wire to Board
 - › Right angle and vertical headers
 - › 2-12 circuits – Dual Row
- › 2 series – Halogen free & Glow wire
 - › Headers will be LCP – 265°C reflow compatible
- › Terminal systems
 - › 12 AWG & 14-16 AWG
 - › Tin and select gold



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Mega-Fit® Power Comparison

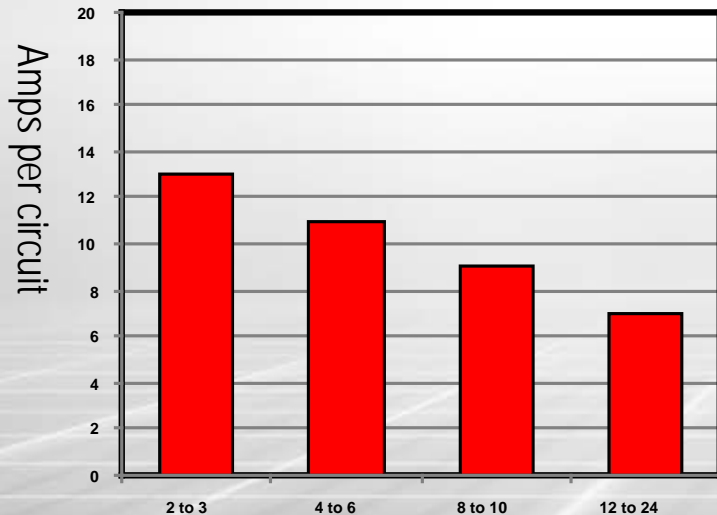
Mini-Fit® Plus HCS



6ckt

13.84mm wide x
9.65mm high =
66A

(Mini-Fit Jr. is 48A)



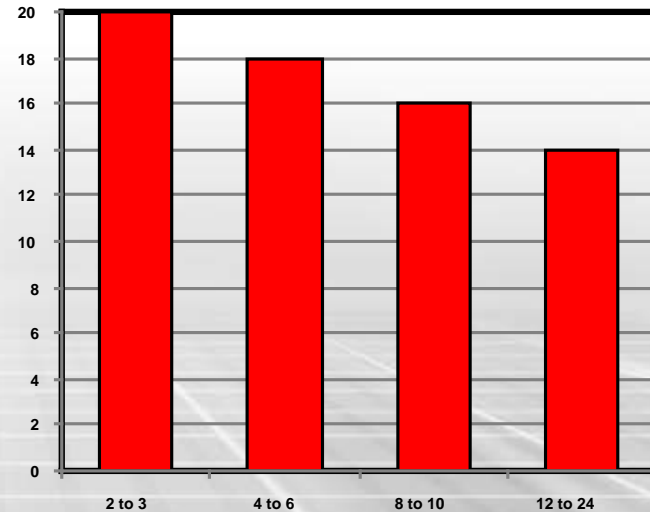
Circuit Size
16 AWG Wire max.

Mega Fit



4ckt

13.04mm wide x
13.34mm high =
72A



Circuit Size
12 AWG Wire max.

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Competition - TE

› Universal MATE-N-LOK II

- 19 Amp max vs. 20 Amp max on Mega-Fiit
- 6.35mm pitch vs. 5.7mm pitch on Mega-Fit

› Not designed for current interruption

› Published amperage for WTW applications

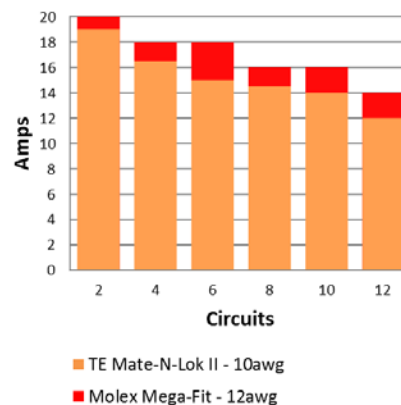
- Right angle WTB = similar ratings (not published)
- Vertical WTB = derate by 25% (not published)

› Housing configuration

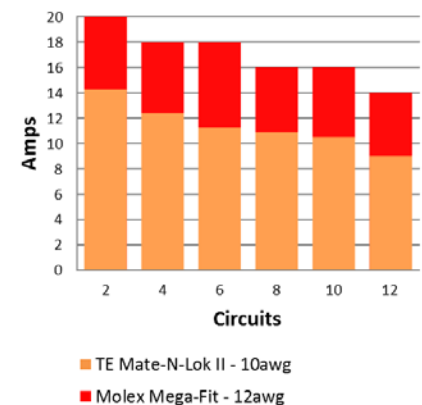
- 2, 4, 6, 8, 10 – dual row
- 12, 15 – 3 row

Better performance from Mega-Fit using 12awg wire over TE Mate-N-Lok II using 10awg wire

Amperage Rating Per Ckt Size
Right Angle WTB



Amperage Rating Per Ckt Size
Vertical WTB



Mega-Fit® Product Launch

› Timeline

- First off tool parts: December 2012
 - Female Terminal
 - Receptacle
 - Right angle header
 - Vertical header
- Production: Q3 Calendar year 2013

› Product modification capabilities

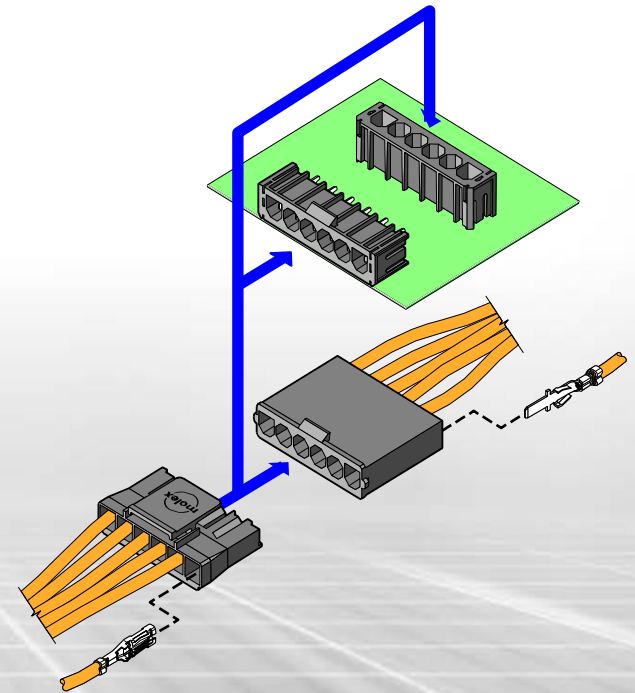
- FMBL (first mate last break)
- Voided circuits

› Samples

- Request first off tool samples today
- Receive samples when available – Early 2013

Sabre

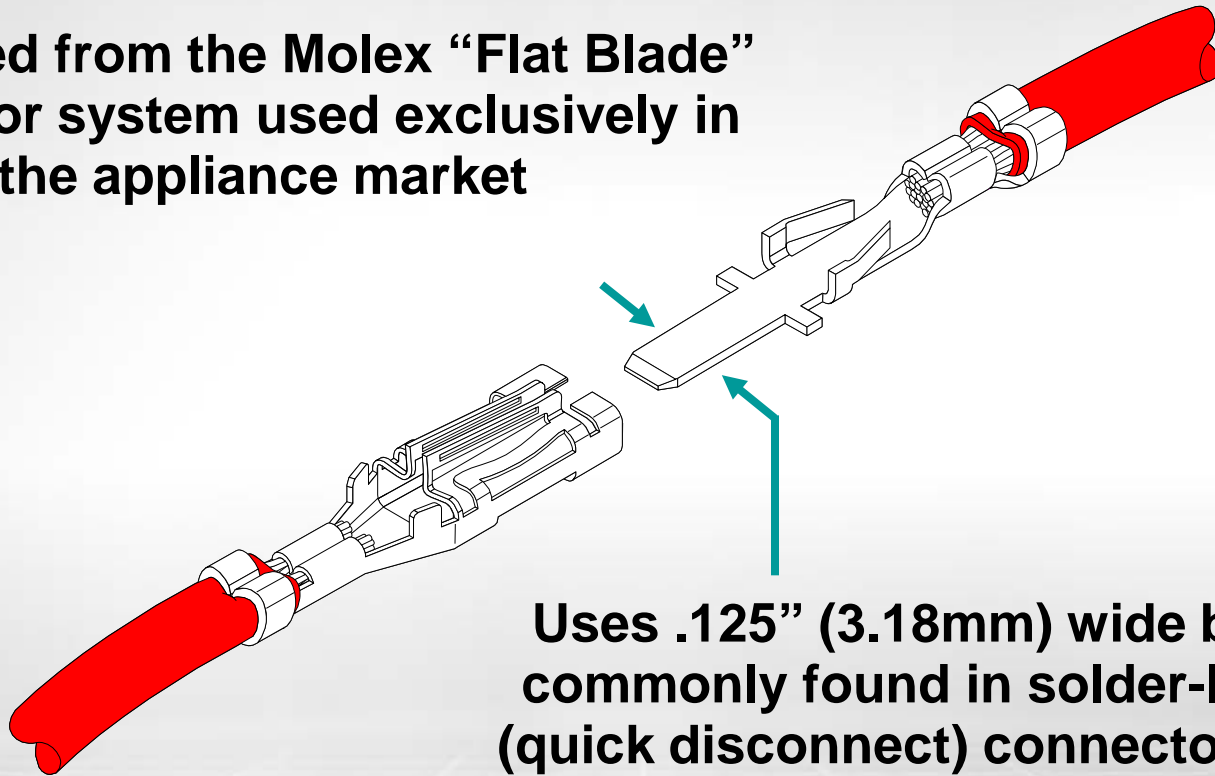
- › Rated up to 18.0 amperes at 600 volts per circuit using 14 AWG wire (fits between Min-Fit Jr. and Mini-Fit® Sr.)
- › Single row products only
- › 2-6 circuits
- › Wire-to-wire or wire-to-board (vertical and right angle headers)
- › Terminals available for single or double crimping wire
- › Low terminal insertion for easy assembly
- › Optional - Terminal Positional Assurance (TPA) feature located on both male and female terminals
- › Headers available with metal PC board fork locks for secure retention during solder processing
- › Terminals based on .125" blade (quick disconnect) design
- › Fits high current requirements up to 18A at 600 volts
- › Easy to assemble



Sabre

Sabre Terminal Design

Developed from the Molex “Flat Blade”
connector system used exclusively in
the appliance market

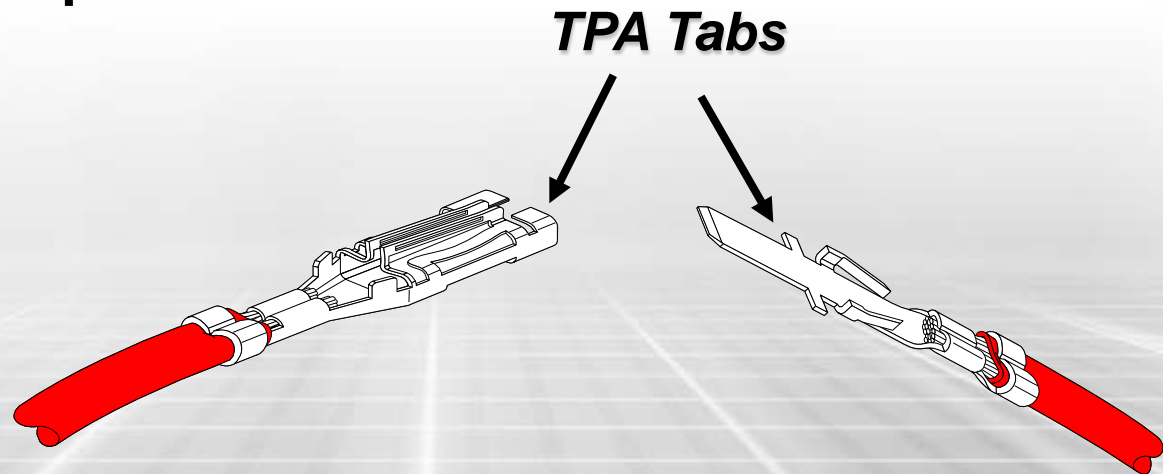


Uses .125" (3.18mm) wide blade tab
commonly found in solder-less style
(quick disconnect) connector systems

Sabre

Terminal TPA Feature

- › TPA (Terminal Position Assurance) is built directly in the male and female terminals
- › Virtually eliminates terminal back-outs
- › No secondary plastic parts to purchase of inventory
- › Activation is optional



Sabre

Competition

- No similar drop in replacement
- Closest offerings
 - Tyco/Amp .093 Soft Shell at 14.0A
 - Tyco/Amp Mate-N-Lok, rated at 15.0A max.

➤ **For More Information:**

Existing Arrow Customers: 800 777 2776

New Customers: 800 833 3557

www.arrownac.com/powermanagement